CLAIMS

What is claimed is:

1. A method of controlling an inverter having a plurality of control inputs and an alternating current multi-phase output, comprising the steps of:

converting the alternating current multi-phase output to a direct current equivalent, wherein the direct current equivalent comprises a plurality of voltage elements and associated current elements, each voltage element and its associated current element corresponding to one phase of the multi-phase output;

comparing each of the plurality of voltage elements to one of a plurality of reference voltages to create a plurality of difference voltage signals;

creating voltage regulating signals from the difference voltage signals, wherein each of the voltage regulating signals comprises a fundamental compensating component combined with an imbalance compensating component;

limiting the voltage regulating signals with a current limiting factor derived from the current elements;

converting the voltage regulating signals to alternating current equivalents; and

producing the plurality of control inputs to the inverter from the alternating current equivalents to thereby enable compensating regulation of the fundamental and imbalance characteristics of the alternating current multi-phase output.

2. The method of claim 1 further comprising the steps of:

calculating a composite current amplitude based on the amplitudes of the current elements;

generating a current difference signal based on the difference between the composite current amplitude and a predetermined maximum current limit;

processing the current difference signal to generate a current limiting factor; and

applying the current limiting factor to each of the voltage regulating signals.

3. The method of claim 1 wherein the step of converting the alternating current multi-phase output is implemented by a Park transformation.

4. The method of claim 1 wherein the step of converting the voltage regulating signals is implemented by an inverse Park transformation.

5. The method of claim 1 wherein the imbalance compensating components of the voltage regulating signals are harmonically related to the fundamental frequency of the inverter.

6. A controller for producing a plurality of control inputs to an inverter having an alternating current multi-phase output, the controller comprising:

a first converter configured to transform the alternating current multi-phase output to a direct current equivalent, wherein the direct current equivalent comprises a plurality of voltage elements and associated current elements, each voltage element and its associated current element corresponding to one phase of the multi-phase output;

a plurality of regulators, each regulator corresponding to one of the plurality of voltage elements, wherein each regulator is configured to compare its respective voltage element to one of a plurality of reference voltages to create a difference voltage signal, and to process the difference voltage signal into a voltage regulating signal, wherein each of the voltage regulating signals comprises a fundamental compensating component combined with an imbalance compensating component;

a plurality of limiters, each limiter corresponding to one of the plurality of voltage regulating signals and configured to limit its respective voltage regulating signal with a current limiting factor derived from the current elements;

a second converter configured to inverse transform the voltage regulating signals into alternating current equivalents; and

an inverter driver configured to process the alternating current equivalents to produce the plurality of control inputs to the inverter to thereby enable compensating regulation of the fundamental and imbalance characteristics of the alternating current multi-phase output.

7. The controller of claim 6 further comprising:

a calculator configured to calculate a current amplitude based on the current elements;

an adder configured to subtract the current amplitude from a predetermined maximum current limit to produce a current difference signal; and

a processor configured to generate a current limiting factor based on the current difference signal, wherein the current limiting factor is applied to each of the voltage regulating signals.

8. The controller of claim 6 wherein the first converter performs a Park transformation.

9. The controller of claim 6 wherein the second converter performs an inverse Park transformation.

10. An inverter system having an alternating current multi-phase output and a controller configured to supply control inputs to the inverter, comprising:

means for transforming the alternating current multi-phase output into an equivalent direct current domain of a plurality of voltage regulating signals and a current limiting factor, each voltage regulating signal corresponding to one phase of the multi-phase output and each comprising a

compensating fundamental component and a compensating imbalance component,

means for limiting each of the voltage regulating signals with the current limiting factor;

means for inverse transforming the limited voltage regulating signals into an equivalent alternating current domain; and

means for processing the inverse transformed limited voltage regulating signals into the control inputs for the inverter, wherein the control inputs enable the inverter to effect compensating regulation of the fundamental and imbalance characteristics of the alternating current multi-phase output.

11. The inverter system of claim 10 wherein the inverter is a 4-leg three-phase inverter.

12. A method of controlling an inverter connected to a load, comprising the steps of:

converting the inverter output from AC domain elements to corresponding DC domain elements;

processing the DC domain elements into combined regulating and imbalance compensating elements;

restoring the combined regulating and imbalance compensating elements to corresponding AC domain elements; and

providing the AC domain combined regulating and imbalance compensating elements to the inverter to stabilize the inverter output to the load.

13. A method of operating an inverter system having an alternating current multi-phase output and a controller configured to supply control inputs to the inverter, the method comprising the steps of:

transforming the alternating current multi-phase output into an equivalent direct current domain of a plurality of voltage regulating signals and a current limiting factor, each voltage regulating signal corresponding to one phase of the multi-phase output and each comprising a compensating fundamental component and a compensating imbalance component,

limiting each of the voltage regulating signals with the current limiting factor;

inverse transforming the limited voltage regulating signals into an equivalent alternating current domain; and

processing the inverse transformed limited voltage regulating signals into the control inputs for the inverter, wherein the control inputs enable the inverter to effect compensating regulation of the fundamental and imbalance characteristics of the alternating current multi-phase output.